

Name: _____

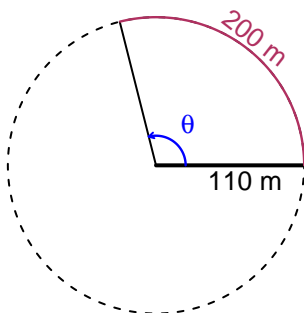
Date: _____

Trig Final (Solution v32)

- You can use a calculator (like [Desmos](#))
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 110 meters. The arc length is 200 meters. What is the angle measure in radians?

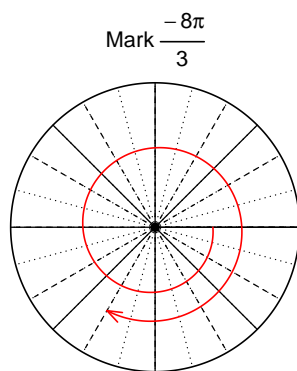


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$\theta = 1.818$ radians.

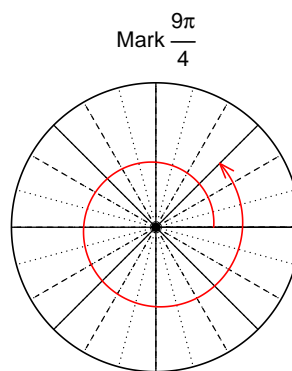
Question 2

Consider angles $-\frac{8\pi}{3}$ and $\frac{9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(-\frac{8\pi}{3}\right)$ and $\cos\left(\frac{9\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(-8\pi/3)$

$$\sin(-8\pi/3) = -\frac{\sqrt{3}}{2}$$



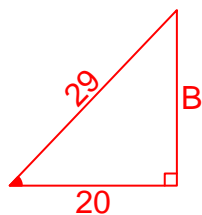
Find $\cos(9\pi/4)$

$$\cos(9\pi/4) = \frac{\sqrt{2}}{2}$$

Question 3

If $\cos(\theta) = \frac{-20}{29}$, and θ is in quadrant III, determine an exact value for $\sin(\theta)$.

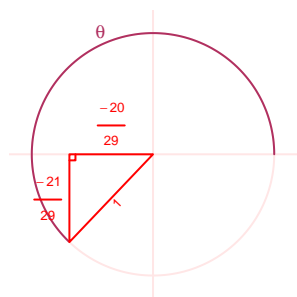
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}20^2 + B^2 &= 29^2 \\ B &= \sqrt{29^2 - 20^2} \\ B &= 21\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\sin(\theta) = \frac{-21}{29}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -8.46$ meters, an amplitude of 5.32 meters, and a frequency of 2.81 Hz. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.32 \cos(2\pi 2.81t) - 8.46$$

or

$$y = 5.32 \cos(5.62\pi t) - 8.46$$

or

$$y = 5.32 \cos(17.66t) - 8.46$$